

## Dynamic Design: A Collection Process

## Module Planning Guide

### The Learning Cycle

| Activity   | Teacher Materials                    | Student Materials                                      | Time approx.       | Standards Addressed (5-8)  | Process Skills  |
|--|--------------------------------------|--|--------------------|--|---|
| <b>BRIEFING</b>  |                                      |  |                    |  |   |
| • It Began With Apollo                                       |                                      | • Student Text   | 45 minutes         | • Science and Technology<br>• History and Nature of Science  | • Communication   |
| • Finding the Perfect Fit                                    | • Teacher Guide                      | • Student Activity<br>• Student Sheet                  | 45 minutes         | • Science and Technology<br>• Mathematics as Problem Solving<br>• Number and Number Relations<br>• Geometry<br>• Measurement | • Problem solving<br>• Communication<br>• Manipulatives<br>• Observation  |
| • Shaping Up   |                                      | • Student Text   | 20 minutes         | • Life Science<br>• Science and Technology   |   |
| <b>EXPLORATION</b>   |                                      |  |                    |  |   |
| • Modeling Solar Wind Collection                             | • Teacher Guide                      | See Sticky Situation, Better Beads, Invisible Analysis |                    | • Science as Inquiry<br>• Physical Science<br>• Science and Technology<br>• Statistics                                       | • Observation<br>• Inference<br>• Prediction<br>• Collecting Data<br>• Interpreting Data<br>• Operational Definitions                                     |
| • Sticky Situation<br>• Better Beads<br>• Invisible Analysis | • See Modeling Solar Wind Collection | • Student Activity Sheets                              | 90 minutes or more | • See Modeling Solar Wind Collection   | • See Modeling Solar Wind Collection  |
| • Continuous Collection                                      | • See Modeling Solar Wind Collection | • Student Text   | 20 minutes         |  |   |
| <b>DEVELOPMENT</b>   |                                      |  |                    |  |   |
| • Enough is Enough   | • Teacher Guide                      | • Student Activity                                     |                    | • Science as Inquiry<br>• Science and Technology<br>• Geometry   | • Observation<br>• Inference<br>• Question<br>• Hypothesis<br>• Communication<br>• Variables<br>• Collecting Data<br>• Interpreting Data<br>• Conclusions |
| • Caution Contaminants !                                     | • See Enough is Enough               | • Student Activity                                     | 90 minutes         | • See Enough is Enough   | • See Enough is Enough  |
| • Micrometeoroids and More                                   | • See Enough is Enough               | • Student Text   | 20 minutes         | • See Enough is Enough   | • Classification  |
| • It's a Hit   | • See Enough is Enough               | • Student Activity                                     | 45 minutes         | • See Enough is Enough   | • Inferences<br>• Research  |

| INTERACTION/SYNTHESIS |                  |                    |                    |  |   |
|-----------------------|------------------|--------------------|--------------------|--|---|
| •Concentrate          | •Teacher Guide   | •Student Activity  | 45 minutes         | <ul style="list-style-type: none"> <li>Science as Inquiry</li> <li>Physical Science</li> <li>Science and Technology</li> </ul> | <ul style="list-style-type: none"> <li>Observation</li> <li>Inference</li> <li>Variables</li> <li>Collecting Data</li> <li>Interpreting Data</li> </ul> |
| •The Concentrator     | •See Concentrate | •Student Text      | 20 minutes         | • See Concentrate  |   |
| • Parabolic Problem   | •Teacher Guide   | •Student Activity  | 45 minutes or more | <ul style="list-style-type: none"> <li>Mathematics as Problem Solving</li> <li>Functions</li> </ul>                            | <ul style="list-style-type: none"> <li>Problem Solving</li> <li>Communication</li> </ul>  |
| • Hot Dog Cooker      |                  | • Student Activity | 90 minutes         | • Physical Science   | <ul style="list-style-type: none"> <li>Measurement</li> <li>Communication</li> </ul>  |

| ASSESSMENT      |                           |                              |            |  |   |
|-----------------|---------------------------|------------------------------|------------|--|---|
| •All Cracked Up | •Teacher Assessment Guide | •Student Assessment Activity | 90 minutes | <ul style="list-style-type: none"> <li>Science as Inquiry</li> <li>Physical Science</li> <li>Science and Technology</li> <li>Science in Personal and Social Perspective</li> </ul> | <ul style="list-style-type: none"> <li>Observation</li> <li>Inference</li> <li>Question</li> <li>Hypothesis</li> <li>Communication</li> <li>Variables</li> <li>Collecting Data</li> <li>Interpreting Data</li> <li>Conclusions</li> </ul> |

### Materials lists for each teacher guide in this module.

Listed below is a quick reference to all of the teacher guides included in this module along with a complete listing of each guide's materials, for your convenience.

#### Finding The Perfect Fit Teacher Guide

For each group of students:

- Student Text, "[It Began With Apollo](#)"
- Student Text, "[Shaping Up](#)"
- Student Sheet, "[Finding the Perfect Fit](#)"
- Student Activity, "[Finding the Perfect Fit](#)"
- Shapes: 20 each of triangles, squares, trapezoids, parallelograms, and rhombi

Option 1: Teacher-made, dye-cut shapes

Option 2: Pattern blocks

- One Centimeter Graph paper
- Colored Pencils or Markers

OR

Option 3: TesselMania® software (see alternative strategies tip)

#### Modeling Solar Wind Collection Teacher Guide

For each group of three to four students:

##### Part 1

Choose four projectiles. Examples include:

|              |                          |            |
|--------------|--------------------------|------------|
| M & M's®     | stone                    | cotton     |
| plastic bead | rubber bead              | hard candy |
| polystyrene  | paper ball (wet and dry) | rice       |

Note: Each projectile should be similar in size.

Each of the four stations should include one of the following surfaces or surface materials:

- |                            |                 |                  |
|----------------------------|-----------------|------------------|
| bread spread with jelly    | ping pong balls | M & M's®         |
| moist sponge               | cake with icing | stones           |
| Jell-O® with whipped cream | polystyrene     | prepared pudding |
| flour or dried rice        | hard candies    | plastic beads    |

## Part 2

- Student Text "[Continuous Collection](#)"
- Small background frame master
- UV sensitive beads
- 3-4 forceps
- Glue stick and or two-sided tape
- Black light

## Part 3

- One bowl of uncooked rice
- 10 small safety pins
- Blind fold
- Watch or clock (minute timer)

## [Enough is Enough Teacher Guide](#)

For each group of three to four students.

### Part I

- Medium-sized transparent plastic cup
- Popcorn kernels (30 ml)
- Pinto beans or lentils (one half cup per group)
- Dried rice (30 ml)

### Part III & IV

- About 15 cm piece of double-sided tape
- Small amount of cleaned beach sand (50 ml) (Can be sand box sand from discount department store)
- Scissors
- Background frame master (from briefing)
- One cm graph paper or transparency
- Triple beam balance

### Part V

- Two dissecting microscopes or hand lens
- One 4x4 cm section of 1 mm graph paper on a transparency

### Part VI

- Three different-sized spheres (BBs, beads, candies)
- Ring stand
- Graham crackers
- Clay or sticky tack
- Stopwatch and meter stick
- Student Text, "[Micrometeoroids and More](#)" (one per student)

## [Concentrate Teacher Guide](#)

For each group of three to four students:

- At least one small plastic butter container with lid
- Enough aluminum foil or other reflective material to line the bottom of the container
- Solar cell with light bulb
- Wire mesh with different sized holes or Polaroid film square (and IR filter)



- (Optional) Parabolic reflector demonstrator
- (Optional) Single rotator radiometer
- Light source (at least 100 watt)
- Student Text: "[The Concentrator](#)"

### Parabolic Problem Algebra Enrichment Teacher Guide

- Graph paper
- paper, pencil
- pipe cleaners and clay
- Calculator (optional)

### All Cracked Up Teacher Guide

For each group of 3-4 students:

- 42 crackers for each frame to be constructed, (small hexagon shape if possible)
- Straws, or coffee stirs to construct frame
- Tape
- Gum or other food that could be used to hold the crackers together

OR

- A large cracker (This can be done for their trial run or instead of constructing the wafers and frames with the smaller crackers.)
- Large crackers can be attached so that there are four suspended in the canister and one in the lid.

AND

- Material for canister (possibly an ice cream canister or coffee can)
- Materials for the students to keep crackers from breaking

Note to teachers: This "at-a-glance" planning guide, as well as the allocated time frames for the activities, are the result of classroom pilot test data. Please contact us with further suggestions as to how we can improve this guide to best meet your classroom needs at [genesisepo@mcrel.org](mailto:genesisepo@mcrel.org).